

RANGES OF TEMPERATURE.

The greatest and least daily ranges of temperature at regular stations of the Signal Service are given in the table of Signal Service data. The greatest monthly ranges of temperature occurred in the Dakotas, where they exceeded 60, whence they decreased eastward to less than 30 on the southeast and extreme east coasts of New England, southeastward and southward to less than 20 over extreme southern Florida and along the east and west Gulf coasts, southwestward to less than 40 over the southern plateau and on the extreme south Pacific coast, and westward to 20 on the coast of north California, and to less than 30 on the extreme north Pacific coast.

FROST.

The night of the 15-16th frost injured vines, buckwheat, potatoes, and corn at Canton, Saint Lawrence Co., N. Y. On the 6th light frost, the first frost of the season, occurred at Saint Vincent, Minn. On the 18th light frost was reported in north Michigan, and the first light frost of the season occurred at Sault de Ste. Marie, Mich. On the 19th light frost was reported in the Dakotas. On the 20th light frost was reported in central and northeast Wisconsin and in east upper Michigan. On the 22d heavy frost, the first of the season, occurred at Saint Vincent, Minn., and light frost was reported at Marshall, Minn.; heavy frost occurred at Saint Lawrence, S. Dak., injuring corn; the first light frost of the season occurred at Huron, S. Dak., and at Moorhead, Minn. On the 23d the first light frost of the season occurred at Grand Haven and Detroit, Mich., and frost injured buckwheat and tender plants at Manton, Mich. On the 24th light frost caused slight damage to vegetation at Alpena, Mich., and light frost was reported in some parts of Pennsylvania. On the 31st light frost was reported at Sault de Ste. Marie, Mich.

Over the eastern part of the country light frost was reported

as far south as north-central Va. on the 24th; in the central valleys to east-central Ill. on the 23d and 28th; generally in the Dakotas and Minn. on the 22d, and in the upper lake region on the 23d; to north-central Colo. on the 26th; in north-east Nev. from the 22d to 25th; and to extreme north-central Cal. on the 31st. Compared with the preceding month the southern limit of frost for August, 1890, was slightly farther south in the Atlantic coast states. No frost was reported in the central valleys in the preceding month. In the plateau region the southern limit was about the same for each month.

The damaging frost of the 15-16th in Saint Lawrence Co., N. Y., was about one month earlier; the heavy frost of the 22d at Saint Vincent, Minn., was about 10 days earlier; that of the 22d at Saint Lawrence, S. Dak., was about 2 weeks earlier; that of the 23d at Manton, Mich., and that of the 24th at Alpena, Mich., was about one week earlier than the average date of first killing frost in the respective localities.

TEMPERATURE OF WATER.

The following table shows the maximum, minimum, and mean water temperature as observed at the harbors of the several stations; the monthly range of water temperature; and the mean temperature of the air for August, 1890:

Stations.	Temperature at bottom.				Mean temperature of air at the station.
	Max.	Min.	Range.	Monthly mean.	
Boston, Mass.	66.0	59.5	6.5	63.9	68.9
Canby, Fort, Wash.	66.5	63.6	2.9	64.7	58.6
Charleston, S. C.	86.8	80.1	6.7	84.7	79.8
Eastport, Me.	53.2	50.1	3.1	52.1	61.4
Galveston, Tex.	88.0	85.0	3.0	86.6	82.6
Key West, Fla.	89.2	83.8	5.4	86.2	81.8
Portland, Oregon	72.0	67.0	5.0	69.9	65.9

PRECIPITATION (expressed in inches and hundredths).

The distribution of precipitation over the United States and Canada for July, 1890, as determined from the reports of nearly 2,000 stations, is exhibited on chart III. In the table of Signal Service data the total precipitation and the departure from the normal are given for each Signal Service station. The figures opposite the names of the geographical districts in the columns for precipitation and departure from the normal show, respectively, the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the precipitation is below the normal and subtracting when above.

The heaviest precipitation reported was 15.39, at Sarcoux, southwest Mo., and Mount Washington, N. H., and the precipitation exceeded 10.00 in north-central Mass., western W. Va., northeast N. C., central Miss., southeast La., southwest Tenn., west-central Ark., southeast Kans., and central Wis. At scattered stations in the Pacific coast states and the plateau region no precipitation was reported, and less than 0.50 fell along the Pacific coast (save on the Washington coast, where it exceeded 2.00), over a greater part of the northern and middle plateau, in southern Mont., southwest N. Dak., northwest S. Dak., the lower Rio Grande valley, southern Ark., and northwest Kans.

Over the central and eastern parts of the country large excesses and marked deficiencies in precipitation occurred in small areas, and in many instances the rainfall was unusually heavy in a portion of a state, while in other parts of the state and at neighboring stations it was deficient. Over the northern plateau and thence southeastward over N. Mex. and southern Tex., and on the middle and extreme south Pacific coasts the rainfall was deficient, while from the Cal. coast between San Diego and San Francisco eastward over the west part of the middle plateau and the west and south parts of

the southern plateau, and along the immediate north Pacific coast it was in excess of the average for August. The greatest excess in precipitation occurred in west-central Ark., where it exceeded 8.00, and at Fort Smith, Ark., 9 years record, the rainfall for the month was 4.63 greater than previously reported for August. In the middle Saint Lawrence valley the excess was 5.91 at Montreal and 4.18 at Quebec; and on the south-central coast of Nova Scotia, along the immediate Atlantic coast from Norfolk, Va., to Atlantic City, N. J., and in the Mississippi Valley from Vicksburg, Miss., to Cairo, Ill., it was more than 3.00. The greatest deficiency in precipitation occurred on the Ga. and east-central and extreme western Fla. coasts, where it was more than 4.00; and the deficiency exceeded 2.00 at stations on the south New England coast, along the south Atlantic and Fla. coasts, and in the lower Rio Grande, upper Mississippi, and middle Missouri valleys. At the following-named stations the precipitation was the heaviest reported for August during the respective periods of observation: Mount Washington, N. H., Strafford, Vt., Statesburgh, S. C., Fort Smith, Ark., Cheyenne, Wyo., Colorado Springs, Colo., Fort Thomas and Wilcox, Ariz., and Keeler, Cal. At Sacramento, Cal., trace of rainfall fell, and trace is the greatest amount of rainfall reported at that station for August. At Red Bluff and San Francisco, Cal., no precipitation occurred, and no precipitation was reported for August of several preceding years.

Considered by districts, the average percentage of the normal in districts where the precipitation was in excess for August, 1890, was about as follows: north Pacific coast, 157 per cent.; Ohio Valley and Tennessee, 140 per cent.; southern plateau, 127 per cent.; middle Atlantic states, 124 per cent.; middle-eastern slope of the Rocky Mountains, 121 per cent.; west Gulf states, 118 per cent.; and lower lake region,

111 per cent. In districts where the precipitation was deficient the percentage of the normal was about as follows: south Pacific coast, 20 per cent.; Rio Grande Valley, 26 per cent.; Key West, 44 per cent.; northern plateau, 62 per cent.; Missouri Valley, 67 per cent.; extreme northwest, 71 per cent.; south Atlantic states, 77 per cent.; east Gulf states and southeast slope of the Rocky Mountains, 81 per cent.; New England, 84 per cent.; northeast slope of the Rocky Mountains and the upper Mississippi valley, 92 per cent.; middle plateau, 85 per cent.; and upper lake region, 93 per cent. On the middle Pacific coast the precipitation averaged trace, while the normal amount for that district is 0.01.

For the period, January to August, 1890, inclusive, the precipitation on the middle Pacific coast averaged about $\frac{1}{2}$ greater, and in the lower lake region and the Ohio Valley and Tennessee $\frac{1}{2}$ to $\frac{2}{3}$ greater than the average, while in the south Atlantic and east Gulf states, at Key West, Fla., in the Rio Grande and Missouri valleys, the middle-eastern and northeastern slopes of the Rocky Mountains, in the middle plateau, and on the south Pacific coast it averaged about $\frac{3}{4}$ of the normal amount for the period named.

DEVIATIONS FROM AVERAGE PRECIPITATION.

The following table shows for certain stations, as reported by voluntary observers, (1) the average precipitation for August for a series of years; (2) the length of record during which the observations have been taken and from which the average has been computed; (3) the total precipitation for August, 1890; (4) the departure of the current month from the average; (5) and the extremes for August during the period of observation and the years of occurrence:

State and station.	County.	(1) Average for the month of Aug.	(2) Length of record.	(3) Total for Aug., 1890.	(4) Departure from average.	(5) Extremes for Aug.			
						Greatest.		Least.	
						Am't.	Year.	Am't.	Year.
<i>Arkansas.</i>		<i>Inches</i>	<i>Years</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>		<i>Inches</i>	
Lead Hill.....	Boone.....	6.06	8	5.73	-0.33	11.53	1888	3.91	1886
<i>California.</i>									
Sacramento.....	Sacramento..	T.	40	T.	0.00	0.08	1864	0.00	•
<i>Connecticut.</i>									
Middletown.....	Middlesex....	5.43	28	4.66	-0.77	10.22	1867	1.16	1865
<i>Florida.</i>									
Merritt's Island..	Brevard.....	6.60	12	2.21	-4.39	15.77	1880	1.15	1883
<i>Georgia.</i>									
Forsyth.....	Monroe.....	4.91	16	2.74	-2.07	7.46	1879	2.50	1888
<i>Illinois.</i>									
Peoria.....	Peoria.....	3.06	34	2.39	-0.67	9.04	1862	0.57	1883
Riley.....	McHenry.....	4.02	39	3.83	-0.19	15.73	1850	0.77	1889
<i>Indiana.</i>									
Logansport.....	Cass.....	3.11	16	2.67	-0.44	6.30	1886	0.67	1881
Vevay.....	Switzerland..	3.25	25	3.46	+0.21	10.90	1875	0.02	1889
<i>Iowa.</i>									
Creco.....	Howard.....	3.18	17	2.79	-0.39	8.34	1884	0.92	1889
Monticello.....	Jones.....	3.83	25	4.97	+1.14	8.54	1885	0.22	1889
Logan.....	Harrison.....	4.46	23	1.19	-3.27	5.15	1889	0.61	1885
<i>Kansas.</i>									
Lawrence.....	Douglas.....	3.76	25	6.19	+2.43	9.07	1888	0.09	1882
Wellington.....	Sumner.....	3.01	11	2.90	-0.11	5.15	1888	0.61	1885
<i>Louisiana.</i>									
Grand Coteau....	St. Landry..	3.77	7	5.29	+1.52	8.07	1888	0.42	1883
<i>Maine.</i>									
Orono.....	Penobscot...	3.54	20	5.47	+1.93	7.36	1885	0.53	1883
<i>Maryland.</i>									
Cumberland.....	Allegany.....	3.06	19	7.07	+4.01	8.09	1882	0.31	1881
<i>Massachusetts.</i>									
Amherst.....	Hampshire...	4.41	54	5.54	+1.13	12.13	1856	0.25	1882
Newburyport.....	Essex.....	3.54	12	4.83	+1.29	7.57	1887	0.75	1883
Somerset.....	Bristol.....	4.28	18	3.45	-0.83	8.08	1880	0.58	1882
<i>Michigan.</i>									
Kalamazoo.....	Kalamazoo...	2.68	14	2.81	+0.13	8.94	1885	0.31	1889
Thornville.....	Lapeer.....	3.01	13	4.56	+1.55	6.69	1877	0.35	1889
<i>Minnesota.</i>									
Minneapolis.....	Hennepin....	3.79	24	2.59	-1.20	11.64	1869	0.47	1883
<i>Montana.</i>									
Fort Shaw.....	Lewis & Clarke	0.76	20	2.40	+1.64	3.01	1876	0.00	71, '89
<i>New Hampshire.</i>									
Hanover.....	Grafton.....	3.67	45	7.77	+4.10	9.46	1849	0.12	1854
<i>New Jersey.</i>									
Moorestown.....	Burlington..	4.62	27	5.49	+0.87	9.44	1882	0.81	1881
South Orange.....	Essex.....	5.33	19	4.43	-0.90	12.55	1875	1.10	1886
<i>New York.</i>									
Cooperstown.....	Otsego.....	3.82	36	6.01	+2.19	9.46	1856	0.63	1876
Palermo.....	Oswego.....	2.56	36	1.95	-0.61	6.40	1864	0.41	1866
<i>North Carolina.</i>									
Lenoir.....	Caldwell.....	5.68	18	9.80	+4.12	10.20	1886	2.10	1877
<i>Ohio.</i>									
N. Lewisburgh..	Champaign..	3.63	18	3.05	-0.58	7.55	1882, '85	0.80	1884
Wauseon.....	Fulton.....	2.81	18	3.48	+0.67	4.86	1886	1.12	1884

Deviations from average precipitation—Continued.

State and station.	County.	(1) Average for the month of Aug.	(2) Length of record.	(3) Total for Aug., 1890.	(4) Departure from average.	(5) Extremes for Aug.			
						Greatest.		Least.	
						Am't.	Year.	Am't.	Year.
<i>Oregon.</i>		<i>Inches</i>	<i>Years</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>		<i>Inches</i>	
Albany.....	Linn.....	0.51	11	0.28	-0.23	1.62	1881	0.00	'85, '88
Eola.....	Polk.....	0.43	21	0.01	-0.42	1.81	1879	0.00	•
<i>Pennsylvania.</i>									
Dyberry.....	Wayne.....	3.71	18	6.35	+2.64	8.77	1885	0.95	1883
Grampian Hills..	Clearfield...	4.24	20	6.41	+2.17	8.19	1888	1.66	1883
Wellsborough....	Tioga.....	5.12	11	6.89	+1.77	15.25	1885	0.83	1889
<i>South Carolina.</i>									
Statesburgh.....	Sumter.....	4.03	9	7.07	+3.04	7.07	1890	2.12	1886
<i>Tennessee.</i>									
Austin.....	Wilson.....	3.67	21	4.70	+1.03	7.80	1871	0.50	1881
<i>Texas.</i>									
New Ulm.....	Austin.....	3.13	18	3.86	+0.73	8.38	1878	0.09	1885
<i>Vermont.</i>									
Strafford.....	Orange.....	3.43	17	8.85	+5.42	8.85	1890	1.40	1882
<i>Virginia.</i>									
Birdsnest.....	Northampton	4.58	21	4.05	-0.53	11.25	1875	0.20	1869
<i>Washington.</i>									
Fort Townsend...	Jefferson....	0.83	16	0.30	-0.53	2.12	1879	0.00	1885
<i>Wisconsin.</i>									
Madison.....	Dane.....	3.23	19	4.23	+1.00	6.83	1882	0.56	1881

*Generally.

EXCESSIVE PRECIPITATION.

Precipitation to equal or exceed 10 was reported at 2 stations in Ark., Kans., La., Miss., and Mo., and at one station in Mass., N. H., N. C., Tenn., W. Va., and Wis.; the greatest, 15.39, being reported at Mount Washington, N. H., and Sarcosie, Mo.

In August of previous years precipitation to equal or exceed 10 has been reported for 31 years in Fla.; for 22 years in Ga.; for 20 years in S. C.; for 16 years in N. C. and Ala.; for 15 years in N. Y.; for 13 years in Iowa; for 11 years in Va.; for 10 years in N. J., La., and Tex.; for 5 to 9 years in Conn., Ill., Ind., Kans., Md., Mass., Nebr., N. H., Ohio, and Pa.; and for one to 4 years in Ariz., Ark., Colo., the Dakotas, Del., D. C., Ind. T., Ky., Me., Mich., Minn., Miss., Mo., N. Mex., Tenn., Vt., W. Va., and Wis. In states and territories other than those named precipitation to equal or exceed 10 has not been reported for August of preceding years. Among the heavier rainfalls reported for August of preceding years are: 30.73 at Fort Barrancas, Fla., in 1878; 28.65 at Asheville, N. C., in 1887; 28.33 at Elsworth, N. C., in 1880; 25.07 at Fort Barrancas, Fla., in 1879; 24.42 at Fort Moultrie, S. C., in 1859; 23.75 at U. S. Naval Hospital, near Portsmouth, Va., in 1867; 23.44 at Maurepas, La., in 1888; 23.40 at Fort Brooke, Fla., in 1840; 23.25 at Newport, Fla., in 1872; 23.04 at Charleston, Ill., in 1882; 23.00 at New Smyrna, Fla., in 1871; 22.74 at New Orleans, La., in 1888; 22.73 at Tarborough, N. C., in 1887; 22.48 at Newark, N. J., in 1843; 21.50 at Saint Augustine, Fla., in 1871; 21.35 at Fairview, Fla., in 1871; and 20.37 at Savannah, Ga., 1841. Exclusive of the instances and years cited monthly rainfall to exceed 15.00 in August has been reported for 6 years in Fla.; for 4 years in Ga., S. C., and Tex.; for 2 years in Conn., Ind., La., Mass., N. Y., Pa., and Va.; and for one year in Ala., Ill., Iowa, Kans., Md., Miss., Nebr., N. H., N. J., N. C., Ohio, Tenn., and Wis.

Precipitation to equal or exceed 2.50 in 24 hours was reported at 15 stations in Miss., and on 5 dates, the 4th, 7th, 19th, 27th, and 28th; at 13 stations in La., and on 6 dates, the 11th, and 24th to 28th; at 10 stations in Kans., and on 12 dates, the 3d, 4th, 9th to 11th, 16th to 20th, 25th, and 26th; at 10 stations in Mo., and on 10 dates, the 6th, 10th, 12th to 16th, 20th, 25th, and 26th; at 10 stations in Ohio, and on 6 dates, the 9th, 20th, 21st, 25-26th, and 27th; at 9 stations in Tenn., and on 9 dates, the 1st, 4th, 5th, 7th, 18th, 22d, and 26th to 28th; at 7 stations in Mich., and on 5 dates, the 3d-4th, 19-20th, and 21st; at 7 stations in N. C., and on 8 dates, the 2d, 3d, 7th, 8-9th, 28th, and 29-30th; at 7 stations in Pa., and on 5 dates, the 4th, 5th, 8th, 18th, and 26th; at 5 stations in Iowa, and on 3 dates, the 3d, 16th, and 24th; at 5 stations in Ind., and on 4 dates, the 8th, 19th, 20th, and 26th; at 4 sta-

tions in Mass., and on 5 dates, the 10th, 17-18th, and 19-20th; at 3 stations in Ga., and on 2 dates, the 4th and 29th; at 3 stations in Ill., and on 2 dates, the 26th and 27th; at 3 stations in Wis., and on 4 dates, the 2d, 3d, 7-8th, and 8th; at 2 stations in Ala., and on 2 dates, the 2d and 15th; at 2 stations in Fla., and on 2 dates, the 16th and 31st; at 2 stations in Md., and on 3 dates, the 21st and 25-26th; at 2 stations in N. J., and on 3 dates, the 19-20th and 27th; at 2 stations in Tex., and on 3 dates, the 28-29th and 30th; at 1 station in Ariz., on the 24-25th; at 1 station in Ark., on the 19-20th; at 1 station in Colo., on the 13-14th; at 1 station in Ind. T., on the 25th; at 1 station in Nebr., on the 17th; at 1 station in N. H., on the 27th; at 1 station in S. C., on the 28-29th; and at 1 station in W. Va., on the 25-26th. Among the heavier rainfalls reported for this period are: 8.10 at Vesper, Kans., on the 19th; 6.00 at Hazelhurst, Miss., on the 27th; 6.00 at Phillips, Wis., on the 8th; 5.10 at Fort Smith, Ark., on the 19-20th; 5.00 at Austin, Mo., on the 25-26th; 4.98 at Gettysburgh, Pa., on the 8th; 4.96 at Washington, Mich., on the 3d-4th; 4.40 at Diamond, Ga., on the 29th; 4.15 at Abbeville, La., on the 11th; and 4.04 at Mount Washington, N. H., on the 27th.

In August of preceding years precipitation to equal or exceed 2.50 in 24 hours has been reported for 19 years in Pa.; for 18 years in Ga., S. C., and Tex.; for 17 years in Mo.; for 16 years in Fla., N. J., and N. C.; for 14 years in Kans., N. Y., and Ohio; for 13 years in Iowa and Miss.; for 12 years in the Dakotas, Mass., and Tenn.; for 11 years in Ala., Conn., Ill., and Minn.; for 10 years in Mich. and Va.; for 5 to 9 years in Ark., Del., Ind., Ind. T., La., Md., Nebr., N. H., W. Va., and Wis.; and for 1 to 4 years in Ariz., Ky., Me., Mont., R. I., and Vt. In states and territories other than those named precipitation to equal or exceed 2.50 in 24 hours has not been reported for August of preceding years. Among the heavier rainfalls reported for this period in August of preceding years are: 10.38 at Griffin, Ga., 8th, 1883; 10.15 at Granbury, Tex., 26th, 1888; 9.75 at Fort Barrancas, Fla., 29th, 1878; 9.14 at Hatteras, N. C., 23d, 1880; 9.00 at Tecumseh, Nebr., 12th, 1889; 9.00 at Elsworth, N. C., 4th, 1880; 8.90 at New Orleans, La., 20th, 1888; 8.54 at Mandeville, La., 8th, 1888; 8.46 at Cape May, N. J., 18th, 1879; 8.14 at Kitty Hawk, N. C., 15th, 1883; 7.75 at Grantsburgh, Wis., 19-20th, 1889; 7.70 at Johnstown, Va., 18th, 1879; and 6.50 at Carson, Iowa, 9th, 1889. Exclusive of the instances and years cited, precipitation to equal or exceed 5.00 in the period named has been reported for 6 years in N. C.; for 4 years in Ill., Mass., and S. C.; for 2 years in Ala., Fla., Kans., N. Y., Tex., and Va.; and for 1 year in Conn., the Dakotas, Iowa, Me., Md., Mo., Nebr., N. J., Pa., and Tenn.

Precipitation to equal or exceed 1.00 in 1 hour was reported at 11 stations in Tex., and on 6 dates, the 3d, 4th, 19th, 25th, 26th, and 28th; at 8 stations in Tenn., and on 7 dates, the 1st to 3d, 5th, 9th, 10th, and 17th; at 7 stations in Pa., and on 4 dates, the 5th, 6th, 19th, and 21st; at 6 stations in Kans., and on 5 dates, the 4th, 16th, 23d, 24th, and 26th; at 5 stations in Miss., and on 4 dates, the 3d, 8th, 9th, and 16th; at 5 stations in Ohio, and on 5 dates, the 2d, 19th, 21st-22d, and 26th; at 4 stations in Colo., and on 3 dates, the 13th, 14th, and 16th; at 4 stations in Ga., and on 3 dates, the 1st, 4th, and 7th; at 4 stations in Iowa, and on 3 dates, the 3d, 16th, and 17th; at 4 stations in Mo., and on 4 dates, the 6th, 8th, 13th, and 16th; at 4 stations in S. C., and on 7 dates, the 8th to 11th, 19th, 20th, and 28th; at 3 stations in Ala., and on 3 dates, the 2d, 9th, and 15th; at 3 stations in Ariz., and on 2 dates, the 7th and 20th; at 3 stations in La., and on 3 dates, the 2d, 16th, and 17th; at 3 stations in N. J., and on 2 dates, the 1st and 27th; at 3 stations in N. C., and on 2 dates, the 3d and 6th; at 2 stations in Fla., and on 2 dates, the 2d and 16th; at 2 stations in Ill., and on 2 dates, the 17th and 26th; at 2 stations in Md., on the 21st; at 2 stations in Mass., and on 2 dates, the 1st and 23d; at 2 stations in W. Va., and on 2 dates, the 1st and 21st; at 1 station in Ind., on the 26th; at 1 station in Ky.,

on the 3d; at 1 station in N. Y., on the 14th; at 1 station in S. Dak., on the 10th; at 1 station in Vt., on the 6th; at 1 station in Va., on the 2d; and at 1 station in Wis., on the 3d. Among the heavier rainfalls reported for 1 hour or less are: 0.35 in 5 minutes, at Philadelphia, Pa., 21st; 1.41 in 18 minutes, at Charleston, S. C., 9th; 1.05 in 20 minutes, at Emporium, Pa., 5th; 1.01 in 20 minutes, at Parkersburgh, W. Va., 1st; 1.00 in 20 minutes, at Mossing Ford, Va., 2d; 1.52 in 24 minutes, at Hardin, Colo., 13th; 1.56 in 30 minutes, at Queensbury, N. Y., and 2.75 to 3.00 in 30 minutes, at Colorado Springs, Colo., 14th; 2.01 in 45 minutes, at Charlotte, N. C., 3d. 3.18 fell in 1 hour and 10 minutes, at Colorado Springs, Colo., 14th; and 4.50 in 1 hour and 30 minutes, at Plover, Wis., 3d.

In August of preceding years precipitation to equal or exceed 1.00 in one hour has been reported for 15 years in Tex.; for 14 years in Pa.; for 13 years in Kans.; for 12 years in Fla., Ga., and Tenn.; for 11 years in Mo.; for 10 years in Ohio; for 5 to 9 years in the Dakotas, Ill., Ind., Iowa, Md., Mich., Miss., Nebr., N. Y., N. C., S. C., and Va.; and for one to 4 years in Ala., Ariz., Ark., Colo., Conn., Del., D. C., Ind. T., Ky., La., Me., Mass., Minn., Mont., N. H., N. J., N. Mex., R. I., and Wis. In states and territories other than those named precipitation to equal or exceed 1.00 in the period named has not been reported for August of preceding years. Among the heavier rainfalls reported for one hour or less in August of preceding years are: for 5 minutes, 0.45 at New York City, 5th, 1884; 0.43 at New York City, 18th, 1887. For 10 minutes, 2.48 at Norfolk, Va., 20th, 1888; 0.59 at New York City, 4th, 1888; 0.50 at Salisbury, N. C., 13th, 1888; 0.40 at New York City, 21st, 1888. For 15 minutes, 5.05 at Saint Louis, Mo., 15th, 1848; 2.12 at Mesquite, Tex., 11th, 1875; 1.40 at Osage, Iowa, 26th, 1881. 1.00 in 18 minutes at Lead Hill, Ark., 2d, 1882. For 20 minutes, 1.27 at Escanaba, Mich., 11th, 1877; 1.25 at Albany, N. Y., 2d, 1878. 1.26 in 23 minutes at Louisville, Ky., 20th, 1878. For 25 minutes, 1.55 at Galveston, Tex., 17th, 1871; 1.33 at Indianola, Tex., 18th, 1882. For 30 minutes, 2.50 at Mesquite, Tex., 10th, 1875; 1.90 at Vevay, Ind., 13th, 1879; 1.95 at Wellsborough, Pa., 21st, 1885; 1.88 at Grantsburgh, Wis., 7th, 1889; 1.52 at Mount Auburn, Ohio, 26th, 1880; 1.50 at Fort Ellis, Mont., 10th, 1883. For 35 minutes, 3.00 at Auburn, N. H., 27th, 1877; 2.20 at Hulmeville, Pa., 25th, 1880; 1.85 at Pittsburgh, Pa., 16th, 1884, and at Cincinnati, Ohio, 27th, 1882; 1.57 at Marietta, Ga., 13th, 1889. 3.50 in 36 minutes at Providence, R. I., 6th, 1878. 3.72 in 41 minutes at Jacksonville, Fla., 20th, 1873. 2.48 in 45 minutes at Detroit, Mich., 31st, 1878. For 50 minutes, 3.00 at Fort Delaware, Del., 31st, 1868; 2.34 at Fort Union, N. Mex., 12th, 1883. At Carson, Iowa, 6.50 fell in 4 hours, 9th, 1889.

Table of excessive precipitation, August, 1890.

State and station.	Monthly rainfall to inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
<i>Alabama.</i>	<i>Inches.</i>	<i>Inches.</i>		<i>Inches.</i>	<i>h. m.</i>	
Auburn.....	3-13	2		3-13	1 30	2
Montgomery.....	2-69	15		1-77	0 55	15
Mount Vernon Barracks.....	1-19	1		1-19	1 10	9
<i>Arizona.</i>						
Fairbank.....				1-50	1 00	7
Florence.....				1-00	0 30	20
Fort Lowell.....	2-50	24-25				
Grand Central Mill.....				1-50	1 00	7
<i>Arkansas.</i>						
Fort Smith.....	10-89	5-10	19-20			
Winslow.....	10-52					
<i>Colorado.</i>						
Colorado Springs.....	3-62	13-14		3-18	1 10	14
Eagle Farm.....				1-40	1 00	16
Hardin.....				1-52	0 24	13
Pueblo.....				1-00	1 00	13
<i>Florida.</i>						
Fort Meade.....	3-00	31				
Homeland.....				1-70	1 30	16
Jupiter.....				2-00	1 00	2
San Antonio.....	2-80	16				

Table of excessive precipitation—Continued.

State and station.	Monthly rainfall to inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
Georgia.						
Athens (1)	Inches.	Inches.		Inches	h. m.	
Augusta		3.04	29	1.40	1 05	7
Diamond		4.40	29	1.70	1 00	1
Macon		2.55		2.00	2 00	4
Point Peter		2.55	4	2.55	1 00	4
Illinois.						
Jordan's Grove		2.81	26			
Mount Carmel		2.96	26-27			
McLeansborough		2.84	26	2.84	2 00	26
Palatine				1.17	1 00	17
Indiana.						
De Gonia Springs		2.97	19-20			
Huntingburgh		3.00	26			
Indianapolis				1.50	1 25	26
La Fayette		3.25	8			
Marengo		2.50	19			
Princeton		2.45	26			
Indian Territory.						
Fort Gibson		2.57	25			
Iowa.						
Clarinda				1.45	0 50	17
Dubuque		2.60	3			
Eagle Grove		2.50	3			
Glenwood		3.30	16			
Manson		2.84	24			
Maquoketa		2.50	16	2.50	2 30	16
Sioux City				1.69	1 35	3
Storm Lake				1.05	1 00	3
Kansas.						
Columbus	11.00					
Conway		4.50	19-20			
Fort Riley		2.50	9-10			
Fort Leavenworth (1)		2.54	4			
Fort Leavenworth (2)				2.00	1 55	4
Kansas City				1.00	1 00	16
Kingman				1.50	1 00	24
La Harpe		3.08	16-17			
Larned				1.50	1 00	23
Leavenworth		2.70	3-4			
Lebo		3.58	10			
Mackaville				1.25	1 00	23
Mankato		2.50	11			
Morse		3.95	25-26			
Peabody		2.75	18			
Vesper	10.80	8.10	19			
Wakefield				1.83	1 30	26
Kentucky.						
Eddyville				1.27	0 30	3
Louisiana.						
Abbeville		4.15	11			
Alexandria		2.90	27			
Amité City				1.00	1 00	16
Clinton		3.76	24			
Do		2.54	27			
Columbia		3.50	27			
Delhi		2.58	28			
Hammond		3.37	27			
Homer				1.90	1 25	17
Houma		3.53	26			
Jeanerette		3.11	26			
Marksville		3.50	27			
Melville				1.15	1 00	2
New Iberia		2.87	27			
Paincourtville	10.68	3.84	26-27			
Plaquemine	10.79	2.55	26			
Thibodaux		3.48	25			
Maryland.						
Baltimore		2.56	25-26	1.96	1 10	21
Barren Creek Springs		2.80	21	2.80	2 00	21
Woodstock						
Massachusetts.						
Cotuit		2.95	10			
Dudley		2.50	17-18	1.00	1 00	23
Royalston	10.75	3.62	17-18			
Do		2.50	19-20			
Vineyard Haven		2.50	10	1.19	1 08	1
Michigan.						
Ball Mountain		4.42	3-4			
Birmingham		3.00	2-3			
Detroit (1)		2.72	21			
Detroit (2)		2.60	21			
Fort Wayne		2.87	19-20			
Grape		2.92	21			
Pontiac		3.42	4			
Washington		4.96	3-4			
Mississippi.						
Agricultural College		3.35	27			
Columbus (2)	10.47	3.15	4			
Corinth		4.10	7			
Fayette				1.52	1 00	16
Hazlehurst		6.00	27			
Holly Springs (2)		2.90	27-28			
Logtown				1.08	1 00	9
Louisville		4.00	27	1.05	1 00	8
Macon (1)		2.50	27			
Moss Point		2.80	19			
Natchez (1)		3.63	27			
Natchez (2)		3.75	27	1.50	1 00	3
Palo Alto		3.01	27			
Pearlington				1.08	1 00	9
Pontotoc		3.00	27			

Table of excessive precipitation—Continued.

State and station.	Monthly rainfall to inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
<i>Mississippi—Continued.</i>		<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>	<i>h. m.</i>	
Rienzi.....		3.20	27			
Vaiden.....	10.01	4.07	27			
Washington.....		4.40	27			
Yazoo.....		3.72	28			
<i>Missouri.</i>						
Austin.....		2.50	16-17			
Do.....		5.00	25-26			
Bethany.....		3.75	12-13			
Bradleyville.....	13.00	3.00	14			
Do.....		3.50	20			
Brunswick.....		3.99	13			
Do.....		2.50	17			
Cassville.....		2.75	10			
Conception.....		2.56	16			
Grand Pass.....				1.00	0 42	16
Jerome.....		2.60	26			
Kansas City.....				1.27	0 46	16
Miami.....		3.90	12-13			
New Frankfort.....		3.50	13			
Sarcoixie.....	15.39	2.63	6	2.63	1 35	6
Do.....		2.93	15-16	2.40	1 10	13
Do.....		3.40	26			
Stollada.....				1.07	0 50	8
Do.....				1.58	1 00	16
<i>Nebraska.</i>						
Plattsmouth.....		2.75	17			
<i>New Hampshire.</i>						
Mount Washington.....	15.39	4.04	27			
<i>New Jersey.</i>						
Atlantic City.....		2.76	27	2.70	1 50	27
Moorestown.....				2.46	2 10	1
New Brunswick.....		3.04	19-20			
Rancocas.....				1.75	1 00	1
<i>New York.</i>						
Queensbury.....				1.56	0 30	14
<i>North Carolina.</i>						
Charlotte.....				2.01	0 45	3
Douglas.....		2.50	7			
Fayetteville.....		2.50	3			
Hatteras.....		3.18	29			
Lumberton.....		3.12	29-30	1.58	1 00	6
Mount Airy.....		2.66	8-9			
Mount Pleasant.....				1.72	1 30	3
Salisbury.....		3.04	28			
Wileyton.....	10.72	2.60	2			
<i>Ohio.</i>						
Bucyrus.....		2.75	26			
Cincinnati.....		2.66	26	1.48	1 10	26
Circleville (1).....		2.51	27			
Circleville (2).....		3.44	26			
Demos.....		2.57	26			
Georgetown.....		2.70	9			
Granville.....		2.63	25-26			
Jefferson (1).....				1.81	1 30	19
Jefferson (2).....				1.66	1 30	21-22
Logan.....		3.99	26	3.45	3 00	26
Marietta.....		3.99	26	3.45	3 00	26
Marietta.....		2.60	20			
McConnelsville.....		2.51	26			
New Comerstown.....				2.04	1 15	19
Portsmouth.....				1.19	1 00	2
Wauseon.....		2.53	21			
<i>Pennsylvania.</i>						
Carlisle.....		3.04	8			
Emporium.....				1.05	0 20	5
Erie.....		2.57	4-5			
Gettysburgh.....		4.98	8			
Grampan Hills.....		2.58	5	1.63	0 40	5
Lewisburgh.....				1.30	1 00	19
Mauch Chunk.....		4.22	26			
Philadelphia.....				1.16	1 00	21
Somerset.....				1.60	1 00	6
South Eaton.....				1.75	1 00	9
Troy.....		4.40	18			
Uniontown.....		3.04	26			
York.....				1.33	1 00	21
<i>South Carolina.</i>						
Charleston.....				1.41	0 18	9
Do.....				1.61	1 20	19
Hardeeville.....				1.74	1 00	8
Do.....				1.48	0 40	11
Spartanburgh (2).....				1.30	0 45	20
Statesburgh.....				1.30	0 48	10
Do.....		3.22	28-29	2.00	0 45	28
<i>South Dakota.</i>						
Rapid City.....				1.17	1 06	10
<i>Tennessee.</i>						
Andersonville.....				1.90	1 30	5
Austin.....				1.50	1 30	17
Bolivar (2).....						
Clarksville.....	12.35	3.95	7			
Do.....		3.00	1	1.10	1 00	17
Fayetteville.....		2.60	22			
Florence Station.....		2.78	28			
Do.....		2.52	4			
Grief.....		3.45	5			
Memphis.....		2.50	26-27	1.75	1 15	2
Milan (2).....		2.65	18			
Nunnelly.....		3.15	18			
Riddleton.....		2.53	26			
Sharps.....				1.20	0 35	9
				1.35	1 10	3

Table of excessive precipitation—Continued.

State and station.	Monthly rainfall in inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
<i>Tennessee—Continued.</i>						
Springdale	Inches.	Inches.		Inches.	h. m.	
Do.		2.69	5			
Trenton		2.75	27	1.96	1 30	1
<i>Texas.</i>						
Brady		2.53	28-29			
Coldwater				1.18	0 40	25
Corpus Christi				1.00	0 55	31
Forestburgh				1.50	1 15	19
Fort Elliott				1.03	1 00	25
Gainesville				1.25	0 30	4
Galveston				1.75	1 00	4
La Grange		2.90	30	2.90	2 20	30
Luling				1.04	1 00	30
New Braunfels				1.39	1 30	26
Paestine				1.56	1 15	3
Round Rock				1.08	0 30	28
<i>Vermont.</i>						
Stratford				1.20	1 00	6
<i>Virginia.</i>						
Mossing Ford				1.00	0 20	2
<i>West Virginia.</i>						
Ella		3.98	25-26			
Glenville				1.00	1 00	21
Parkersburgh				1.01	0 20	1
Point Pleasant		10.26				
<i>Wisconsin.</i>						
Grantsburgh		4.50	7-8			
Phillips		6.00	8			
Plover		10.91	2	4.50	1 30	3
Do		4.50	3			

Reports received too late to be used in general discussion for August, 1890.

<i>Indiana.</i>						
Vincennes		2.83	27			

Received too late for publication in July Review.

<i>Arizona.</i>						
Crittenden				1.60	0 30	17
<i>North Carolina.</i>						
Douglas	11.65	2.50	24			
Highland	14.48	3.36	23-24			
Marion		3.10	5			
Do		3.02	24			
Raleigh	11.30					
Smithfield	10.05					
<i>Wisconsin.</i>						
Grantsburgh				2.00	1 20	16

HAIL.

Description of the more severe hail storms of the month is given under "Local storms." Hail was reported as follows: 1st, Pa. 2d, Ill., Iowa, Nebr., Va. 3d, Ga., Iowa, Minn., Va., S. Dak., Va., Wis. 4th, Colo., Kans., Mich., Mo., N. B. 5th, N. Y. 6th, Ala., Iowa, N. Dak. 7th Minn., Nev., S. Dak., Wis. 8th, Ala., Ariz., Ind., Mich., Mo., Wis. 9th, Ky., N. Y.

10th, Conn., Md., Mass., N. Dak., N. J., N. Y., S. Dak. 11th, Ariz., Colo., Nebr. 12th, Colo., Nev. 13th, Colo., Kans., Mo., Nev. 14th, Colo., Nev., N. Y. 15th, Colo., S. Dak. 16th, Colo., Wyo. 17th, Ill., N. Y., Tex. 18th, Colo., Kans. 19th, Colo. 20th, Va. 21st, Md., N. Y., Pa. 22d, Nebr., Nev., N. Dak., Tex. 23d, Kans., Mont., S. Dak. 24th, Nebr., N. Dak., S. Dak. 25th, Colo., Kans., Mo., Nev., N. Mex. 26th, Colo. 27th, Tex. 28th, Kans., Mich. 29th, Nev., N. Dak., Tex. 30th, Tex., Wash.

SNOW.

The Signal Service observer at Harrisburg, Pa., reports that a few flakes of snow fell at that place the morning of the 23d; snow flurries were also reported in Northampton and Northumberland counties, Pa., on the 23d. The Signal Service observer at Sault de Ste. Marie, Mich., states that light snow was reported along the upper Saint Marie River the evening of the 9th.

SLEET.

Sleet was reported at Moorhead, Minn., 24th, and in Colo. on the 27th.

MAXIMUM RAINFALL IN ONE HOUR OR LESS.

The following table is a record of the heaviest rainfall during August, 1890, for periods of five and ten minutes and one hour, as reported by regular stations of the Signal Service furnished with self-registering gauges:

Station.	Maximum fall in—					
	5 min.	Date.	10 min.	Date.	1 hour.	Date.
	Inch.		Inch.		Inch.	
Bismarck, N. Dak.	0.05	23	0.10	23	0.20	23
Boston, Mass.	0.05	20	0.10	20	0.31	20
Buffalo, N. Y.	0.20	21	0.30	5	0.60	20
Cincinnati, Ohio	0.25	26	0.40	26	1.10	26
Chicago, Ill.	0.20	21	0.27	21		
Cleveland, Ohio	0.25	4	0.40	4	0.60	4
Denver, Colo.	0.17	11	0.30	11	0.62	25
Detroit, Mich.	0.15	21	0.20	21	0.75	21
Dodge City, Kans.	0.15	4, 30	0.20	4, 30	0.50	4
Duluth, Minn.	0.25	7	0.32	7	0.78	7
Galveston, Tex.	0.40	4	0.75	4	1.75	4
Jupiter, Fla.	0.35	2	0.70	2	1.80	2
Marquette, Mich.	0.01	28	0.04	28	0.20	28
Memphis, Tenn.	0.32	26	0.60	26	1.24	2
New York City	0.15	10, 22	0.25	22	0.93	22
New Orleans, La.	0.18	24	0.25	19	0.41	19
Norfolk, Va.						
Philadelphia, Pa.	0.35	21	0.53	21	1.16	21
Portland, Oregon	0.05	31	0.05	31	0.10	31
Savannah, Ga.	0.20	10	0.30	10	0.70	10
San Diego, Cal.						
San Francisco, Cal.	†		†		†	
Santa Fe, N. Mex.						
Saint Louis, Mo.	0.15	8	0.21	8	0.50	8
Saint Paul, Minn.						
Washington City	0.30	1	0.55	1	0.82	21
Wilmington, N. C.	0.25	22	0.40	22	1.27	22

* Not sufficient to register. † No rain. ‡ Rain-gauge not working. § Rain-gauge failed.

WINDS.

The prevailing winds during August, 1890, are shown on chart II by arrows flying with the wind. In New England, the upper lake region, and on the northeast slope of the Rocky Mountains the winds were mostly from southwest to northwest; in the middle Atlantic states, south to west; in the south Atlantic states, the upper Mississippi valley, and the southern plateau region, southeast to southwest; in the Florida Peninsula, the east Gulf states, and the lower Rio Grande valley, east to southeast; in the west Gulf states, northeast to southeast; in the Ohio valley and Tennessee, south to southwest; in the lower lake region, and on the south Pacific coast, west to northwest; in the Missouri Valley, and on the middle-eastern and southeast slopes of the Rocky Mountains, south to southeast; on the north Pacific coast, north to west; and in the extreme northwest, the northern plateau region, and on the middle Pacific coast, variable.

HIGH WINDS (in miles per hour).

Wind velocities of 50 miles, or more, per hour were reported at regular stations of the Signal Service, as follows: 7th, 56, nw., at Fort Sully, S. Dak. 10th, 60, sw., at Rapid City, S. Dak. 21st, 61, sw., at Mount Killington, Vt. 24th, 58, n., at Valentine, Nebr. 27th, 96, nw., at Mount Washington, N. H.; 74, w., at Green Mountain, Me. 29th, 85, nw., at Mount Washington, N. H.; 54, e., at Winnemucca, Nev. 30th, 50, sw., at Winnemucca, Nev.

LOCAL STORMS.

During the afternoon of the 1st a heavy thunder-storm, with vivid lightning, rain, and hail, passed over Philadelphia, Pa. In the evening severe electric storms occurred on the New Jersey coast. A thunder-storm from the west passed over Cincinnati, Ohio, at 1.20 p. m., with heavy rain, and wind 35 miles per hour from the nw. The high wind lasted but 10 minutes,